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Infinite-Valued Propositional Type Theory for Semantics

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Abstract

In natural language semantics along the lines of Montague the simple type theory by Church functions as a kind of universal logic where possible worlds are treated as indices. The logic is also the starting point for many automated reasoning systems and is one of the traditional foundations of mathematics. However, in natural language semantics consistency cannot be assumed and a paraconsistent logic seems needed. The combination of higher order logic and paraconsistent logic has not been much investigated. We propose a paraconsistent type theory that is in a sense even a simplification of the simple type theory. There is only one basic type, namely the type of propositions, with a countably infinite universe of truth values. The system can be seen as a many-valued variant of the elegant propositional type logic by Henkin and Andrews, and it has interesting relationships to transfinite type theory.

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It will be very important as we proceed to keep in mind this distinction between the logic we are studying (the object logic) and our use of logic in studying it (the observer's logic). To any student who is not ready to do so, we suggest that he close the book now, and pick some other subject instead, such as acrostics or beekeeping.

Stephen C. Kleene: *Mathematical Logic* (1967) p. 3